Consider a virtual memory system with two processes. **Process 1** consists of 8 words (*a* through *h*) and **Process 2** has 8 words (*A* through *H*). The physical memory consists of 16 words and the page size is four words.

(A) Show the contents of the 4 pages of the physical memory based on the given information.

Process P1

Virtual Address	Contents
0	a
1	b
2	c
3	d
4	e
5	f
6	g
7	h

Page Table for P1

Virtual Page	Physical Page
0	3
1	0

Process P2

Virtual Address	Contents
0	A
1	B
2	C
3	D
4	E
5	F
6	G
7	H

Page Table for P2

Virtual Page	Physical Page
0	1
1	2

Physical Memory

Physical Address	Contents
0	e
1	f
2	g
3	h
4	A
5	B
6	C
7	D
8	E
9	F
10	G
11	H
12	a
13	b
14	c
15	d

(B) Suppose the process P1 and P2 are the only processes running on the system, will P2 or P2 ever have a page fault on memory accesses? Explain.

No. Both P1 and P2 can be loaded completely into memory. If there are no other processes on the system then no swapping will occur and so no page faults will occur.

(C) Suppose the Physical memory was only 12 words (3 pages) instead of 16 words (4 pages). Would a page fault be possible if both P1 and P2 are running? Explain.

Yes. P1 and P2 require 4 pages of physical memory. The system only has 3 physical pages of memory, so one process page of virtual memory will not be in physical memory and will need to be swapped in when the page fault occurs.

(D) Fill in the ***Physical Address*** **column** by translating the Virtual address to the Physical address. Fill in the ***Virtual Address*** **column** by translating from the Physical address to Virtual address.

Process		Virtual Address	*Physical Address*		Physical Address	*Virtual Address*
P1		2	14		13	1
P2		2	6		5	1